Phytoplankton Monitoring

Poster by Anke Mueller-Solger, DWR

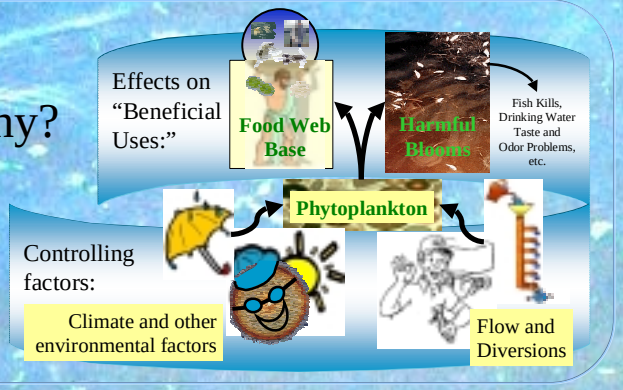
Poster Background: *Microcystis* bloom on the San Joaquin River

Program Chief: Steve Hayes, DWR

Sampling

- Monthly since 1971 (D-1379)
- Pump or Van Dorn water samples
- Same discrete stations as water quality sampling
- Special sampling: Phytoplankton bloom tracking since 1970

Why?



Information and Data

Information: Casey Ralston, DWR-ESO
cralston@water.ca.gov, (916) 227-0438

Data Base:

Phytoplankton: http://sarabande.water.ca.gov: 8000/~bdtdb/phytoplankton.html

Chlorophyll *a*: http://sarabande.water.ca.gov:8000/~bdtdb/misc_lab_analysis11.html

Species Identification and Enumeration

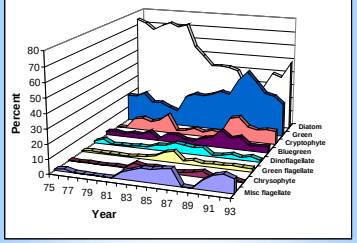
George Weber (DWR, photos above) identifies and enumerates phytoplankton samples using the Utermoehl technique (1958). Equipment: Settling chambers, Wild inverted microscope with camera, computer with custom counting and data entry software (includes taxonomic "Phytoplankton Dictionary"). George is a 28-year Delta phytoplankton veteran. In addition to George, seven other DWR employees have analyzed Delta phytoplankton samples since 1970. Mark Bettencourt (DWR) is currently in training.

Some Recent Results:

P.W. Lehman (DWR), 2000. The influence of climate on phytoplankton community biomass in San Francisco Bay Estuary. L.&O.

Percent diatom density decreased from 1975-89 while the relative density of green, blue-green, and flagellated algae increased. This change was related to water diversion and climatic patterns. While pennate diatoms, green, and blue-green algae were more positively associated with wet conditions and negatively with dry conditions, the opposite was true for green and miscellenous flagellates

Modified from P.L. 2000, Fig. 2a. Yearly average percent density among phytoplankton species groups.



Correlation between principal component axes describing climatically related environmental axes and phytoplankton species group biomass. Correlations are significant at the 0.01 (bold type) and 0.05 (regular type) level. n=60. Modified from P. Lehman 2000, Table 2.

	Environmental axes			
	Axis 1	Axis 2	Axis 3	Axis 4
Group	"wet-cool"	"wet-warm"	"dry-cool"	"dry-warm"
Diatom - all			-0.31	-0.27
Pennate diatom	**0.76**		-0.27	**-0.37**
Centric diatom			-0.29	
Green	**0.62**	-0.26	**-0.35**	-0.28
Bluegreen	**0.57**		-0.28	
Cryptophytes		**-0.43**		
Green flagellates	**-0.44**			
Misc flagellates	**-0.46**	-0.27		**0.33**
Dinoflagellates				
Chrysophytes				

A.D. Jassby (UCD) and J.E. Cloern (USGS), 2000. Organic matter sources and rehabilitation of the Sacramento-San Joaquin Delta (California, USA) Aquatic Conservation.

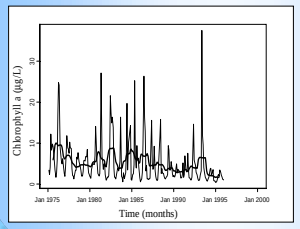
Most POM in the Delta comes from tributaries. However, in spring and summer of critically dry years, phytoplankton production can equal or even exceed allochthonous inputs and the Delta becomes a net producer of organic matter.

Net* organic carbon sources for the Delta's food web (t C day-1). Modified from Table 6, Jassby and Cloern 2000 (p. 341) Phytoplankton net primary productivity (NPP) estimated based on chlorophyll a and other measurements.

	Phytoplankton NPP	Tributary load	Agricultural drainage
Wet ("above normal")			
Autumn	3	51	3.3
Winter	3.9	460	10
Spring	58	110	3.9
Summer	54	74	3.8
Dry ("below normal")			
Autumn	14	53	3.3
Winter	17	82	10
Spring	81	44	3.9
Summer	50	48	3.8

* (1) Phytoplankton productivity has been corrected for respiration, and (2) tributary load and agricultural drainage have been corrected for refractory DOC and losses of labile DOC during conversion to heterotroph biomass

A. Mueller-Solger (DWR/UCD), A. Jassby, and D. Mueller-Navarra in prep. Nutritional value of particulate organic matter for zooplankton (*Daphnia*) in a tidal freshwater system (Sacramento-San Joaquin Delta, USA)



Chlorophyll *a* concentrations calculated on a Delta-wide basis have declined from 1975-1995. Thin line: monthly time series; thicker line: yearly moving average. Graph by Alan Jassby.

Chlorophyll Analysis at DWR Bryte Lab

The DWR Bryte Lab is located in West Sacramento. It has maintained certification by the Environmental Protection Agency and the California Department of Health Services for water analysis since 1978. It provides chemical analyses, quality assurance, and related technical services.

Mark Bettencourt (DWR-Bryte lab, photo above) analyzes chlorophyll *a* samples with a spectrophotometer using Standard Methods SM 10200H (2000) at Bryte lab. From 1968 to 1998, chlorophyll *a* was measured spectrophotometrically using a modified version of SM 10200H according to Doug Ball (USBR). From 1972 to 1998 DWR staff (K.Triboli) carried out these analyses at a USBR facility in Sacramento. A study comparing the current and previous techniques is under way.